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Journal of Biology, Agriculture and Healthcare
ISSN 2224-3208 (Paper) ISSN 2225-093X (Online)
Vol.7, No.9, 2017
www.iiste.org

Prevalence of Gestational Diabetes Mellitus in Sub-Saharan Africa in 2000 and Beyond: A Systematic Review

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Abstract
Introduction: Gestational diabetes mellitus (GDM) is the common cause of hyperglycaemia in pregnancy, accounting for about 90% of all diabetes during pregnancy. A diabetic pregnant woman and her unborn child are at increased risk of pregnancy complications. Gestational diabetes mellitus has long-term public health significance, contributing to the escalating type 2 diabetes epidemic. Understanding the magnitude of gestational diabetes mellitus in Africa may provide evidence on how interventions should be targeted to reduce the magnitude of the problem, to improve maternal and child health and to reduce the burden of type 2 diabetes in the region. **Objective:** The aim of this systematic review was to assess the prevalence of Gestational diabetes mellitus in Sub-Saharan Africa**Methods**: A systematic computer based literature search was conducted for published papers on gestational diabetes in sub-Saharan Africa in 2000 and beyond. The PRISMA guidelines (Checklist, Moher D. et al 2009) for the reporting of systematic reviews were followed. A comprehensive key word search strategy was done in Google scholar and PubMed for terms associated with diabetes and pregnancy and sub-Saharan Africa. Articles Published in English language were included. Data were then extracted regarding country, residence (rural/urban), population group, sample size, age of pregnant women in the cohort, gestational age, how they tested for GDM and what GDM prevalence was reported**Result:** We identified 7 studies conducted in five of (about 10% of) the 47 sub-Saharan African countries. Most of the studies conducted in West Africa. It needs more effort to work in the area of GDM in Sub-Saharan Africa since only about 10% of the countries had studies on GDM in the year 2000-2016. The most commonly employed method for GDM screening in Sub-Saharan Africa is the two hour 75 g OGTT with glucose reference ranges as set by the WHO 1985 or 1999 diagnostic criteria. The percentage of women affected with GDM in this review was as low as 4.8% in Nigeria and as high as 11.6% amongst urban Kenyan women. This review has found some evidence of an increase in the prevalence of GDM in Sub-Saharan Africa. **Conclusion:** There are few studies on prevalence GDM in sub-Saharan Africa. The most commonly employed method for GDM screening in Sub-Saharan Africa is the two hour 75 g OGTT with glucose reference ranges as set by WHO diagnostic criteria. The prevalence was high and needs preventive measures to reduce maternal and child complications related to GDM in sub-Saharan Africa.
Keywords: Gestational Diabetes Mellitus, Sub-Saharan Africa

Introduction

Gestational diabetes mellitus is defined by the World Health Organization as being ‘‘any degree of glucose intolerance with onset or first recognition during pregnancy’’. In recent times, prevalence of hyperglycemia in pregnancy in women 20–49 years was estimated to be 16.9% worldwide and affecting 21.4 million live births, in 2013, and more than 90% of cases are estimated to occur in low- and middle-income countries [1]. Gestational diabetes mellitus (GDM) is the common cause of hyperglycaemia in pregnancy, accounting for about 90% of all diabetes during pregnancy [2].

A diabetic pregnant woman and her unborn child are at increased risk of pregnancy complications[3]. Gestational diabetes mellitus has long-term public health significance, contributing to the escalating type 2 diabetes epidemic. Although GDM is a temporary phenomenon for the pregnant woman, more than 50% of women with GDM develop type 2 diabetes within 5-10 years of delivery. Moreover, infants of women with GDM have a higher prevalence of overweight or obesity as young children and adolescents, and a higher risk of developing type 2 diabetes later in life [4].

Review on diabetes in Sub-Saharan Africa included the prevalence of gestational diabetes was not recent and majority of the data used were researches conducted about decades ago. This review aims to investigate the prevalence of Gestational Diabetes mellitus in Sub-Saharan Africa by using more recent evidences and publications from original research conducted in the area.

Objective

The aim of this systematic review was to assess the prevalence of Gestational Diabetes mellitus in Sub-Saharan Africa.

Methods

Searching strategy

A systematic computer based literature search was conducted for published papers on gestational diabetes in sub-Saharan Africa in 2000 and beyond. The PRISMA guidelines (Checklist, Moher D. et al 2009) for the reporting of systematic reviews were followed. A comprehensive key word search strategy was done in Google scholar and PubMed for terms associated with diabetes and pregnancy and sub-Saharan Africa, sub-African region or country specific were used. Articles Published in English language were included. We included original published articles reporting prevalence of GDM in any Sub-Saharan country regardless of screening and diagnostic criteria used, and regardless of method used for selection of participants. Studies which reported only type 1 and/or type 2 diabetes were excluded.

The following search terms and combinations were used: ‘‘gestational diabetes’’ and Sub-Saharan Africa; ‘‘impaired fasting glucose’’ and pregnancy and Sub-Saharan Africa; diabetes and pregnancy and Sub-Saharan Africa; ‘‘impaired glucose tolerance’’ and pregnancy and Sub-Saharan Africa; ‘‘gestational diabetes’’ and ‘‘Sub-Saharan African countries.’’ In addition, the search terms ‘‘gestational diabetes,’’ together with the names of each individual country in Sub-Saharan Africa were used. For example, ‘‘gestational diabetes’’ and Nigeria; ‘‘gestational diabetes’’ and Tanzania; ‘‘gestational diabetes’’ and ‘‘South Africa’’ were entered into the search. The list of all recognized Sub-Saharan Africa countries included in the search.

Study selection

First titles of articles were retrieved based on search terms and abstracts were obtained, the abstracts were reviewed and finally all articles found to be eligible for full document review were reviewed in detail.

Data Extraction

Full text articles were obtained and reviewed. Data were then extracted regarding country, region (rural/urban), population group, sample size, age of pregnant women in the cohort, gestational age, how they tested for GDM and what GDM prevalence was reported. In addition, data were also extracted from abstracts that included how GDM was screened for, what criteria were used and what prevalence figures were obtained in the study but for which full text articles could not be obtained.

The most recognized diagnostic test for GDM is the oral glucose tolerance test (OGTT) usually performed between 24–28 weeks gestation [5]. Different screening regimes for GDM exist and as a result studies investigating prevalence of GDM are often diverse in terms of methods employed, cut-off values used and consequently, results obtained [6].

Table 1 summarizes some of the different screening regimes and respective glucose cut-off values used to diagnose GDM.

Table 1: Diagnostic criteria used to diagnose GDM.

No.	Organization	Screening test	Blood Glucose threshold	Diagnostic criteria
1	WHO 1985[7]	2 hr 75g OGTT	Fasting ≥7.8 mmol/L 2 hr ≥11.1 mmol/L	At least one
2	WHO 1999[8]	2 hr 75g OGTT	Fasting ≥7.0 mmol/L 2 hr ≥7.8 mmol/L	At least one
3	WHO 2013[9]	2 hr 75g OGTT	Fasting: 5.1-6.9 mmol/L 1 hr ≥10 mmol/L 2 hrs ≥8.5-11.0 mmol/L	At least one
4	International Association of Diabetes and Pregnancy Study Group (IADPSG)[10]	75g OGTT	Fasting 5.1-6.9 mmol/L 1 hr ≥ 10 mmol/L 2 hr ≥ 8.5-11.0 mmol/L	At least one
5	American Diabetes Association (ADA)[11] **Two steps** Step 1	50 g (1 hr ≥ 7.8 mmol/L)	Fasting 5.3 mmol/L 1 hr ≥ 10.0 mmol/L 2 hrs ≥ 8.6 mmol/L 3 hr ≥ 7.8 mmol/L	Two or more
	Step 2	100g OGTT	Fasting ≥5.8 mmol/L 1 hr ≥ 10.6 mmol/L 2 hr ≥ 9.2 mmol/L 3 hr ≥ 8.0 mmol/L	
		One step: 75g OGTT	Fasting ≥5.3 mmol/L 1 hr ≥ 10 mmol/L 2 hrs ≥8.6 mmol/L	At least one
6	Australian Diabetes Association In Pregnancy Society (ADIPSI)[12]	75g OGTT	Fasting ≥5.1 mmol/L 1 hr ≥ 10 mmol/L 2 hr ≥ 8.5-11.0 mmol/L	At least one
7	Diabetes In Pregnancy Study Group India (DIPSI)[13]	75g OGTT	2 hr ≥7.8 mmol/L	Only one
8	Diabetes Pregnancy Study Group (DPSG)[14]	75g OGTT	Fasting >5.2 mmol/L 2 hr ≥ 9.0 mmol/L	At least one
9	National Diabetes Data Group (NDDG)[15]	3 hr 100g OGTT	Fasting ≥5.8 mmol/L 1 hr ≥10.6 mmol/L 2 hrs ≥9.2 mmol/L 3 hrs ≥ 8.0 mmol/L	At least two

Result and Discussion

The review included studies conducted within the previous 16 years (2000–2016).Initially, total of 962 articles identified by data base searching search terms. For total retrieved articles, titles and abstracts were reviewed and 895 articles were excluded because they were not relevant after title screening, 54 conducted before 2000 and objectives of the studies were not the interest of review after reviewing abstract and 6 studies conducted outside Sub-Saharan Africa. Finally seven articles were obtained for final review.

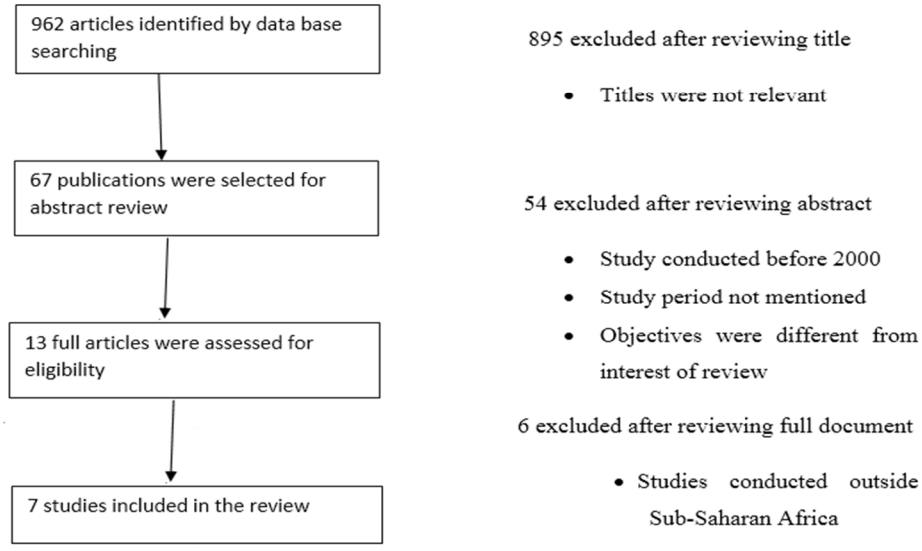

Diagram shows how studies were selected

This systematic review focused on studies in Sub-Saharan African countries that provided information

on the GDM screening methods employed, the diagnostic criteria used and the prevalence figures obtained.

We identified 7 studies conducted in five of (about 10% of) the 47 sub-Saharan African countries. Most of the studies conducted in West Africa. This shows very few studies conducted in Sub-Saharan Africa when compared with review conducted in Europe which included 23 countries. Based on this systematic review, it needs more effort to work in the area of GDM in Sub-Saharan Africa since only about 10% of the countries had studies on GDM in the year 2000-2016. More epidemiological based studies on GDM in Sub-Saharan African countries need to be performed in order to provide reliable information and thus clarity on the extent of GDM. For effective delivery of maternal and child health services related to GDM, detail understanding of the problem is vital. As GDM often results in macrosomic infants, birth trauma and the need for Caesarean sections at delivery are expected. This is precarious as it impacts both maternal and child survival during delivery, and places a significant economic burden on the health system, which in many African countries is already struggling with limited resources.

The most commonly employed method for GDM screening in Sub-Saharan Africa is the two hour 75 g OGTT with glucose reference ranges as set by the WHO 1985 or 1999 diagnostic criteria. One of the reported studies used National Diabetes Data Group (NDDG) criteria. This finding is consistent with review conducted in Europe, most studies used World Health Organization criteria for screening and diagnosing gestational diabetes. National Diabetes Data Group criteria were less often used.

The percentage of women affected with GDM in this review was as low as 4.8% in Nigeria and as high as 11.6% amongst urban Kenyan women. The prevalence is higher when compared with the review conducted in Europe which ranges from 2-6%. This review has found some evidence of an increase in the prevalence of GDM in Sub-Saharan Africa.

Conclusion

There are few studies on prevalence GDM in sub-Saharan Africa. The most commonly employed method for GDM screening in Sub-Saharan Africa is the two hour 75 g OGTT with glucose reference ranges as set by WHO diagnostic criteria. The prevalence was high and needs preventive measures to reduce maternal and child complications related to GDM in sub-Saharan Africa.

Conflict of interest

The author(s) declare that we have no competing interests.

Table 2; General characteristics of studies included in systematic review[16-22]

S.N	Author/s	Year	Country	Setting	Study design	Population	Screening criteria	Prevalence of GDM
1	Ewenighi Chinwe O. et al	2011	Nigeria	Urban	Cross sectional	250	National Diabetes Data Group (NDDG) criteria	4.8
2	Olarinoye et al.	2004	Nigeria	Urban	Prospective cohort	293	WHO	6.45
3	Akwilina W. et al	2012	Tanzania	Urban and Rural	Cross sectional	910	WHO	5.9
4	Bosire A.N, Joseph K.	2011	Kenya	Urban	Cross sectional	371	WHO	11.6
5	Anzaka AS, Musa J.	2009	Nigeria	Urban	Cross sectional	265	WHO	8.3
6	R. L. Mamabolo et al	2000	South Africa	Semi-Rural	Cross sectional	262	WHO	8.8
7	Jennifer Jao et al	2013	Cameroon	Semi-Urban	Cross sectional	316	WHO	6.3

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